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Z. O. MELNYK (IN HONOUR OF THE 90TH ANNIVERSARY OF BIRTH)

M. M. Bokalo, O. M. Buhrii, V. M. Kyrylych, O. Z. Slyusarchuk. *Z. O. Melnyk (in honour of the 90th anniversary of birth)*, Mat. Stud. **63** (2025), 102–107.

Some pages of biography and main scientific achievements of Zinovii Ostapovych Melnyk (1935-1983), a famous mathematician, are presented.

In February 2025 we celebrate the 90th anniversary of the birth of the renowned scientist, excellent teacher and great organizer of science Zinovii Ostapovych Melnyk, who worked for almost thirty years at the Faculty of Mechanics and Mathematics of Ivan Franko State University of Lviv (now, Ivan Franko National University of Lviv). In this article, which complements [1, 2], we want to recall the main milestones in the life and scientific and teaching activities of this charismatic personality and teacher.

Z. O. Melnyk was born on February 10, 1935 in the village of Radenychi, Mostysky district, Lviv region, in a peasant family. He was educated at the local school in the village of Radenychi until the 7th grade, and in the 8th and 10th grades – in the Mostyska secondary school. In 1951 he entered the Faculty of Mechanics and Mathematics of the Ivan Franko State University of Lviv (hereinafter referred to as the University). He graduated with honors in 1956, and on November 1 of the same year he became a graduate student of the Department of Differential Equations. His scientific supervisor was Prof. Ya. B. Lopatynsky, who was the head of the Department of Differential Equations at that time. The name of Lopatynsky is associated with the study of general elliptic systems of partial differential equations, the development of potential theory methods for these systems. He constructed local fundamental solutions of general elliptic systems and presented their various applications to study properties of other solutions of these systems. Ya. B. Lopatynsky became

2020 *Mathematics Subject Classification:* 01A60, 01A70.
Keywords: biography; Melnyk.
doi:10.30970/ms.63.1.102-107

the founder of the theory of general boundary value problems for linear elliptic systems. He formulated the condition for reducing a general boundary value problem to a regular system of integral equations of the Fredholm type. Now it is known in the literature as the "Lopatynsky condition". He also had important results on the solution of mixed problems for general systems of differential equations of the hyperbolic type, on the application of Morse methods to variational elliptic problems, and in a number of other areas (for more details see [3]). In particular, he obtained these results during the Lviv period of his life (1946–1963).

While studying in graduate school in 1956–1959, Zinovii Ostapovych Melnyk also worked as an assistant at the Department of Higher Mathematics, the Department of Differential Equations, the Department of Theory of Functions, and as a Senior Researcher at the Department of Mechanics of the University.

Since September 1959, Z. O. Melnyk worked first as a Senior Lecturer, and later as an Associate Professor at the Department of Differential Equations. He also occupied a position of a Senior Researcher at the Computing center of the University. Zinovii Ostapovych taught normative and special courses: "Differential Equations", "Equations of Mathematical Physics", "Integral Equations", "Operational Calculus", "Cauchy Problem for Hyperbolic Equations", as well as a course in higher mathematics for students of the Faculty of Physics.

Z. O. Melnyk was actively engaged in scientific work. He was primarily interested in initial-boundary value problems for hyperbolic equations and their systems. One of first his scientific results was the justification of the applicability of the method of reflections to the study of general second-order hyperbolic equations. Using the method of energy integrals, he proved the existence of solutions to initial-boundary problems for some hyperbolic equations and higher-order systems. He presented his scientific results at scientific conferences, city mathematical seminars, scientific seminars of the department etc.

On October 21, 1963 Z. O. Melnyk defended his PhD thesis entitled "Initial-boundary Problems for Some Hyperbolic Equations and Systems" at the Specialized Academic Council of the University. The opponents of the dissertation were Doctor of Physics and Mathematics Sci. Prof. M. P. Sheremetyev and Candidate of Physics and Mathematics Sci. I. M. Kovalchyk. Back then the examination of dissertations took a very long time, so the diploma of Candidate of Physical and Mathematical Sciences was awarded to Zinovii Ostapovych on December 29, 1965, that is, 2 years after thesis defense. Z. O. Melnyk received a diploma of Associate Professor of the Department of Differential Equations in February 1968.

In September 1967, he was sent to the Republic of Guinea for a period of two years to teach at the Guinea Polytechnic Institute. During his time in Guinea, Zinovii Ostapovych lectured in French and conducted seminars on mathematical physics, Lie group theory, topological methods in the theory of differential equations, programming, mathematical analysis, differential geometry, calculus of variations, etc. The lectures became a foundation for his 385–page long textbook titled "Methods of Mathematical Physics". He led a scientific seminar, was a member of the commission for the development of institute's curricula, supervised students' graduation projects, headed the department, and acted as the dean of the Faculty of Sciences.

Later, on September 26, 1969, Z. O. Melnyk was sent to the Republic of Tunisia. There he first worked at the University of Tunis (October 1969 – September 1970), and later at the Tunisian National Engineering Institute (September 1970 – August 1972). At the University of Tunis, he taught a special course "Lie Group Theory and Its Application to Differential Equations", and a course "Differential Calculus in Normed Vector Spaces" (lecture courses

and task book were also published). He was a member of the Academic Council of the Faculty of Sciences. At the Tunisian National Engineering Institute, he taught the "Course of Mathematics" (a course of lectures and task book were also published). He was a member of the council of the institute for the preparation of plans and programs and control over methodological work.

After his return to Lviv, Zinovii Ostapovych was appointed a Head of the Department of Optimal Processes of the University on October 11, 1973. Later, on September 28, 1979, Zinovii Ostapovych became the head of the Department of Differential Equations of the University and held this position until the last days of his life.

Zinovii Ostapovych lectured on Differential Equations, Equations of Mathematical Physics, Methods of Solving Boundary Value Problems for Hyperbolic Equations, Functional Methods in the Theory of Optimization, Fundamentals of Scientific Researches. He supervised the students' term papers and diploma theses, and contributed to the scientific research of the department on variational methods for calculating some deflecting magnetic systems.

Along with his teaching responsibilities, Z. O. Melnyk was successfully engaged in scientific research in the theory of partial differential equations. The subject of Z. O. Melnyk's scientific research can be determined from the publications given here. His scientific worldview was significantly influenced by Ya. B. Lopatynsky and the associated circle of scien Rasulov, V. Ya. Skorobogatko, I. V. Skrypnyk.

Z. O. Melnyk obtained very important scientific results, including:

- construction of the theory of initial-boundary problems for hyperbolic equations and systems of general form with two independent variables in cases of both smooth and nonsmooth initial data;
- proving the existence of solutions of initial-boundary problems for multidimensional hyperbolic equations in the case of analytical and piecewise analytic initial data;
- establishment of conditions for the solvability of initial-boundary problems for two-dimensional hyperbolic equations with multiple characteristics.

Zinovii Ostapovych initiated research in new areas of partial differential equation theory at the Department of Differential Equations, that have been actively developed by the members of the Department and their students:

- boundary value problems with a small parameter (V. M. Tsymbal, V. M. Flyud, V. V. Voloshyn, P. P. Babak, O. V. Tereshchuk);
- problems in areas with unknown boundaries (Stefan's hyperbolic problems) (T. O. Melnyk, V. M. Kyrylych, G. I. Beregova, R. V. Andrusyak, N. O. Burdeyna);
- problems with non-local (non-separated and integral) boundary conditions (V. M. Kyrylych, G. I. Beregova, R. V. Andrusyak, O. Z. Slyusarchuk, M. O. Oliskevych, O. V. Pelyushkevych, L. Zaremba, T. O. Derevyanko);
- problems for countable hyperbolic systems (V. M. Kyrylych, T. I. Firman);
- impulse hyperbolic equations (V. M. Kyrylych, M. V. Prokhorenko);
- inverse problems for hyperbolic equations (V. M. Kyrylych, R. V. Andrusyak, G. I. Beregova);
- optimal control of hyperbolic systems (V. M. Kyrylych, T. O. Derevyanko).

From June 16, 1974 till May 21, 1980, Z. O. Melnyk was the Dean of the Faculty of Mechanics and Mathematics. In this position, he greatly contributed to the development of scientific research at the faculty.

Zinovii Ostapovych was directly involved in the mentoring of scientific staff. Under his supervision, V. M. Tsymbal defended his Ph. D. thesis in 1979, and V. M. Kyrylych began to work on his dissertation in December 1981.

Z. O. Melnyk actively worked on his doctoral thesis on the theory of hyperbolic equations, prepared a monograph together with A. D. Myshkis on the theory of hyperbolic problems. Unfortunately, these plans did not come to pass. The life of Zinovii Ostapovych Melnyk was cut short in early 1983.

Z. O. Melnyk's scientific research was continued by his students V. M. Tsymbal and V. M. Kyrylych and their students. And also S. P. Lavrenyuk together with his students continued these investigations.

It should also be mentioned that mathematics was revered in the family of Z. O. Melnyk. His wife Tetyana Omelyanivna taught mathematical subjects at the faculty. His daughter Olga (O. Z. Slyusarchuk) earned her Ph. D. on differential equations at the Faculty of Mechanics and Mathematics and currently works as an Associate Professor at the Lviv Polytechnic National University.

Colleagues and students of Zinovii Ostapovych have been grateful to work and communicate with an intelligent, democratic, open, and sensitive Person and Teacher. Zinovii Ostapovych Melnyk paved the way for many, so that their first steps on this road were easy.

List
of the main publications of of Zinovii Ostapovych Melnyk

1. Melnyk Z.O. *Initial boundary value problem for some hyperbolic equations.* Collection of the works of the LDU postgraduates. Lviv, 1960.
2. Melnyk Z.O. *Some remark to map method for hyperbolic equations.* Collection of the works of the LDU postgraduates. Lviv, 1961.
3. Melnyk Z.O. *On method of solving of initial boundary value problem for hyperbolic equations.* Anniversary scientific meeting of LDU: Book of abstracts. Lviv, 1961.
4. Melnyk Z.O. *Initial boundary value problem for third and fourth order hyperbolic equations on plate.* Reports of Academy of Science of Ukrainian SSR. (1963) №9.
5. Melnyk Z.O. *Initial boundary value problem for some hyperbolic systems.* Reports of Academy of Science of Ukrainian SSR. (1964) №3.
6. Melnyk Z.O. *On some special initial boundary value problem.* Reports of Academy of Science of Ukrainian SSR. (1964) №5.
7. Melnyk Z.O. *On periodic solutions of general second order hyperbolic equation on plate.* Anniversary scientific meeting of LDU: Book of abstracts. Lviv, 1964.
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11. Melnyk Z.O. *General initial boundary value problem for some system of integro-differential equations.* Reports of Academy of Science of Ukrainian SSR. (1965) №6.
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22. Mel'nik Z.O. *On hyperbolic equations with multiple characteristics.* Differential Equations. 1974; 10 (8): 1530–1532.
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26. Kyrylych V.M., Melnyk Z.O. *Problem without initial conditions for general two-dimentional hyperbolic equation with discontinuous coefficients.* Third Republican Symposium on Differential and Integral Equations (Odesa, June 1-3, 1982): Book of abstracts. P. 110–111.
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Theses defended by the disciples of Zinovii Melnyk and the disciples of his disciples

1. Tsymbal V.M. *Some boundary value problem for differential equations of hyperbolic type with small parameter.* Minsk, 1979. Scientific Supervisor: Cand. Sc. (Phys.-Math.) Associate Prof. Melnyk Z.O.
2. Kyrylych V.M. *Nonlocal Darboux-type problems for hyperbolic equations and systems with two independent variables*, Donetsk, 1984; Scientific Supervisors: Melnyk Z.O., Myshkis A.D. *Free boundary problems for hyperbolic systems of quasilinear equations with first-order partial derivatives*, Kyiv, 2010; Scientific Consultant: Myshkis A.D.
3. Flyud V.M. *Some boundary value problems for singularly perturbed hyperbolic systems*, Donetsk, 1987; Scientific Supervisor: Cand. Sc. (Phys.-Math.) Associate Prof. Tsymbal V.M.
4. Voloshyn V.V. *Some problems for singularly perturbed hyperbolic systems*, Lviv, 1996; Scientific Supervisor: Cand. Sc. (Phys.-Math.) Associate Prof. Tsymbal V.M.
5. Babak P.P. *Problems for multicomponent diffusion systems and construction of asymptotics with respect to small parameter*, Lviv, 1998; Scientific Supervisor: Cand. Sc. (Phys.-Math.) Associate Prof. Tsymbal V.M.
6. Beregova G.I. *Problems with unknown boundaries for hyperbolic equations and systems with two independent variables*, Lviv, 1998; Scientific Supervisor: Cand. Sc. (Phys.-Math.) Associate Prof. Kyrylych V.M.

7. Andrusyak R.V. *Stefan problem for one-dimensional hyperbolic systems*, Lviv, 2006; Scientific Supervisor: Cand. Sc. (Phys.-Math.), Associate Prof. Kyrylych V.M.
8. Prokhorenko M.V. *Problems with impulse action at non-fixed time instants for systems of ordinary differential equations and partial differential equations*, Lviv, 2010; Scientific Supervisor: Cand. Sc. (Phys.-Math.) Associate Prof. Kyrylych V.M.
9. Burdeyna N.O. *Problems with moving boundaries for hyperbolic systems of quasilinear equations*, Lviv, 2011; Scientific Supervisor: Dr. Sc. (Phys.-Math.) Associate Prof. Kyrylych V.M.
10. Pelyushkevych O.V. *Problems for degenerate hyperbolic systems of first-order equations with two independent variables*, Lviv, 2013; Scientific Supervisor: Dr. Sc. (Phys.-Math.) Prof. Kyrylych V.M.
11. Tereshchuk O.V. *Initial boundary value problems for singularly perturbed hyperbolic systems of first-order equations*, Lviv, 2016; Scientific Supervisor: Dr. Sc. (Phys.-Math.) Prof. Kyrylych V.M.
12. Firman T.I. *Problems for countable hyperbolic systems of first-order equations*, Lviv, 2017; Scientific Supervisor: Dr. Sc. (Phys.-Math.) Prof. Kyrylych V.M.
13. Derevyanko T.O. *Problems of optimal control of hyperbolic systems*, Lviv, 2017; Scientific Supervisor: Dr. Sc. (Phys.-Math.) Prof. Kyrylych V.M.

Acknowledgements. The authors express their great gratitude to Dr. Ya.G. Prytula (Lviv) for providing archival documents, to Dr. V.A. Vlasov (Lviv) for translating the text into English, and to H.Ye. Grabchak (Lviv) for preparing the LaTeX-file of the article.

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Received 15.12.2024